ABSTRACT OF THE INVENTION

An atomic force microscope utilizing an optical system having a numerical aperture sufficient with the wavelength of light of an incident beam to form a spot on the cantilever having a size of 8 μm or less in at least one dimension. An adjustable aperture can be utilized to control the size and/or shape of the incident beam spot on the cantilever. Portions of the incident beam and the beam reflected from the cantilever overlap and are directed so that the plane of focus of the incident beam is parallel to the plane of the cantilever. The incident and reflected light beams are separated by polarization using a beamsplitter in conjunction with a quarterwave plate. Focussing can be accomplished with a confocal viewing system coupled with a translatable focusing lens common to the optical system and viewing system. The atomic force microscope enables use with a plurality of cantilevers on the same chip wherein the focus of the incident beam is shifted from one cantilever to another while remaining substantially in focus. One of the focusing lenses can be mounted in close proximity to the cantilever to provide a high numerical aperture. An optional adjustable lens can also be mounted on the module. A piezoelectric tapping element can be embedded in a base plate of the cantilever module for tapping mode AFM.